

Map 12-1. Tooele County

Part XII. Tooele County

Tooele County is the second largest county in Utah in land area, with 6,923 square miles. Salt Lake and Utah Counties bound the county to the east, Juab County to the south, Davis and Box Elder Counties to the north, and to the west, the State of Nevada. Three fourths of the population lives in the eastern valleys where most of the irrigated and dry farm land is located. The western sectors make up the Great Salt Lake Desert and are more arid and generally uncultivated. Tooele County includes seven municipalities (Grantsville, Ophir, Rush Valley, Stockton, Tooele City, Vernon, and Wendover) and nine unincorporated areas (Burmeister, English Village, Erda, Ibapah, Lakepoint, Loftgreen, Pine Canyon, and Stansbury Park). Percent of land ownership is 78.5% Federal, 5.9% State, 0.3% Native American, 11.2% Private and Local Government and 4.1% water.

Tooele County migration patterns show that most of the 1980's are characterized by out-migration. However, beginning in 1996, an in-migration trend began due to cheaper housing in the county. Population growth and new commercial development are expected to occur in relatively undeveloped areas of the region.

New commercial development is projected in Tooele County to serve the increasing numbers of residences in the county. Tooele County is projected to almost double its population to 112,722 by 2030 (UPEC 2008). A significant portion of this increase is expected to commute to Salt Lake County for work. Recent census data show that approximately 40 percent of Tooele County's work force commutes to Salt Lake County. The 2005 numbers for persons per square mile within the county was 7.5, most of which are located in the eastern portion of the county.

Construction activity in the county exploded in 1996 and steadily increased through the end of the millennium. Housing growth slowed slightly in the early part of this decade, but had been regaining momentum as of 2005 with 738 new permitted dwellings (BEBR 2007). The recent economic slowdown in Utah has largely been driven by reductions in new construction.

In 2005, the average monthly wage in the county was \$2,942, 7.5% higher than the state average of \$2,736 (BEA 2007). Total personal income in millions in 2005 was \$492 million (BEA 2007). The 2005 per capita income was \$22,442 (UDWS 2006). Employment in Tooele County is based on three main types of industry: *government* (23.8%), *trade/transportation/utilities* (14.9%), and *professional and business services* (14.0%). Other important sources of employment in the county are *manufacturing* (8.6%), *education and health services* (8.0%), *leisure and hospitality* (7.4%), and *construction* (6.3%). Some of the largest employers include Tooele County School District, Dugway Proving Grounds, EG&G Defense Materials, Detroit Diesel, U.S. Magnesium, Wal-Mart, Tooele County, and the Tooele Valley Regional Medical Center (UDWS 2007b).

Hazard History

Identifying past hazard events is the key to predicting where future events could occur. The SHELDUS database was used to assess significant historical disasters causing greater than \$50,000 in damages per event. Some disasters involved multiple counties of which the damages were not limited to an individual county. These damages were split evenly amongst the involved counties resulting in partial injuries and fatalities. As this database is monetarily-based, the number of injuries and fatalities for each hazard may be underestimated for each hazard here. All damages are computed in 2005 dollars (refer to figures 12-1 and 12-2).

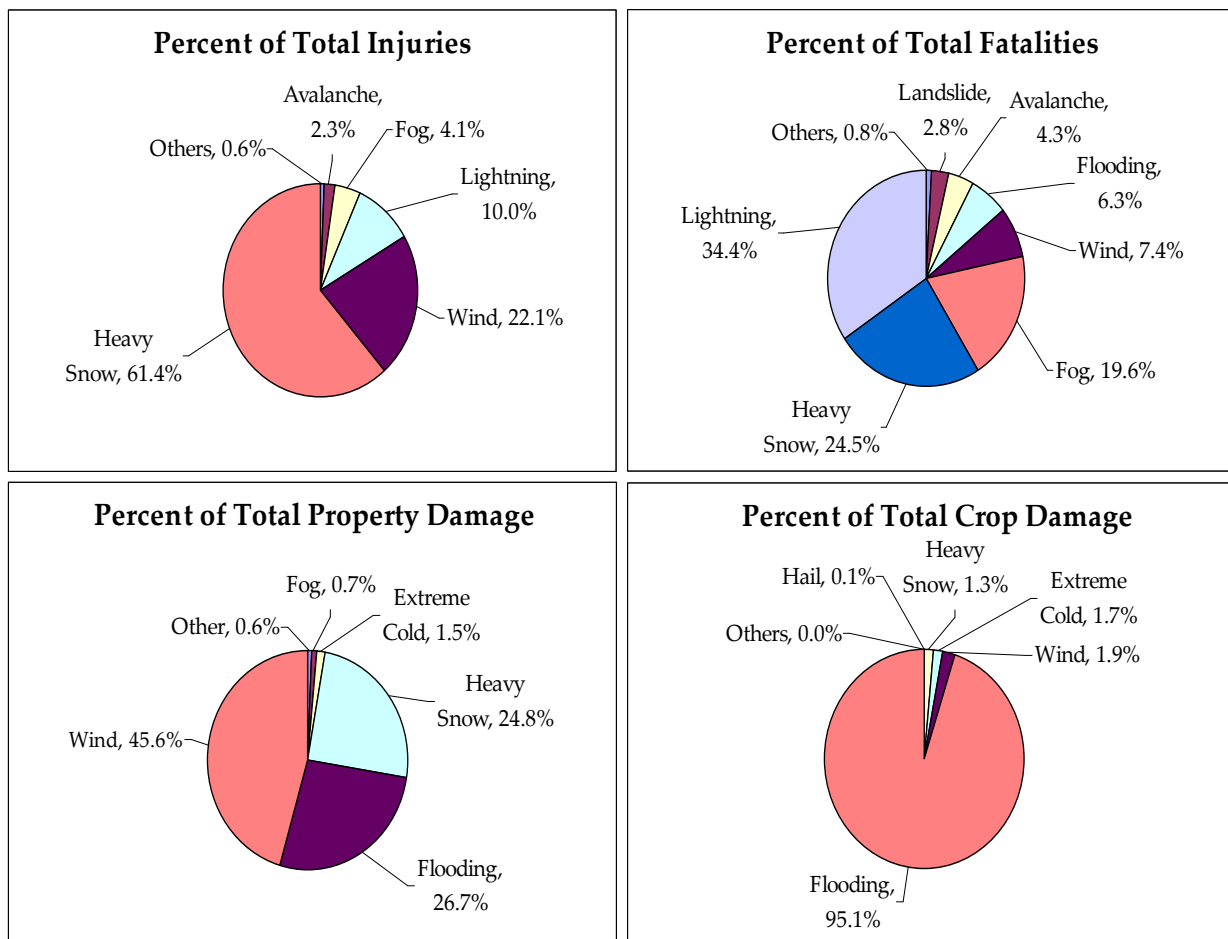


Figure 12-1. Major Disaster Event Averages 1962-2005, Tooele County, Percentages (HVRI 2007)

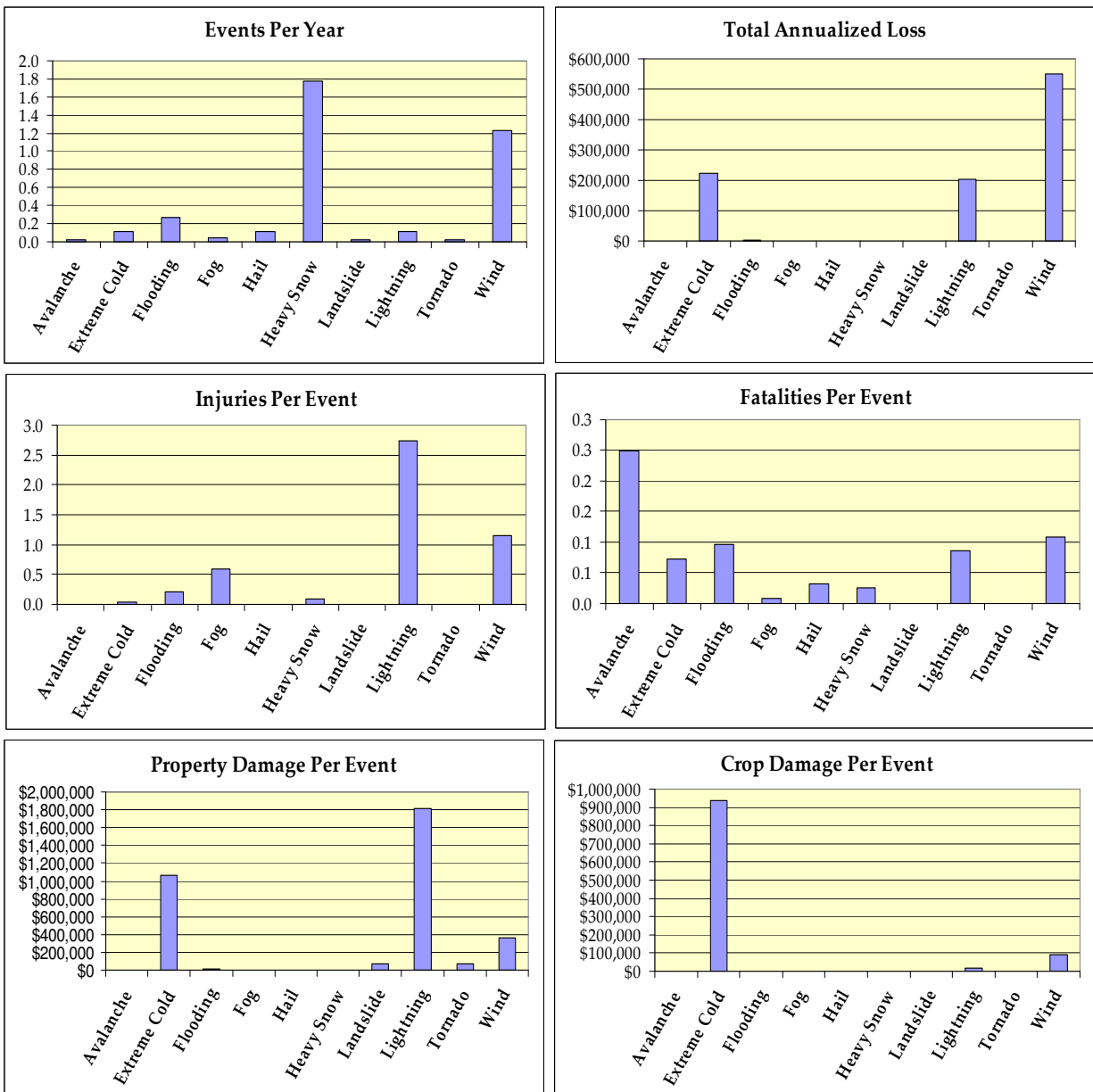


Figure 12-2. Major Disaster Event Annual and Per Event Averages 1962-2005, Tooele County, Counts (HVRI 2007)

Risk Assessment

The risk assessment process revealed the following for Drought, Earthquake, Flood, Infestation, Landslide/Slope Failure, Severe Weather and Wildland Fire. Drought, Infestation and Severe Weather are considered to be regional hazards and can be found in Part XIII. Refer to Part VII for an explanation of the risk assessment methodology. According to this data, there are a total of 54 identified critical facilities within Tooele County. For the complete list refer to Appendix D.

Number of Structures with Moderate or Greater Vulnerability (% of Total)								
Critical Facilities	Total	<i>Dam Failure</i>	<i>Flood</i>	<i>Ground Shaking</i>	<i>Liquefaction</i>	<i>Problem Soils</i>	<i>Slope Failure</i>	<i>Wildfire</i>
Amateur Radio Repeaters	14	0 (0%)	0 (0%)	14 (100%)	1 (7%)	0 (0%)	11 (79%)	14 (100%)
Public Safety Repeaters	50	0 (0%)	0 (0%)	50 (100%)	0 (0%)	0 (0%)	33 (66%)	50 (100%)
Fire Stations	5	2 (40%)	0 (0%)	5 (100%)	1 (20%)	0 (0%)	0 (0%)	0 (0%)
Hospitals	1	1 (100%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Oil Facilities	1	1 (100%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Police Stations	4	3 (75%)	0 (0%)	4 (100%)	1 (25%)	0 (0%)	0 (0%)	0 (0%)
Schools	26	10 (38%)	1 (4%)	26 (100%)	4 (17%)	1 (4%)	1 (4%)	0 (0%)
Water Treatment Facilities	4	2 (50%)	4 (100%)	4 (100%)	2 (50%)	0 (0%)	0 (0%)	0 (0%)

Table 12-1. Critical Facilities Vulnerability Matrix for Local Hazards, Tooele County NA=Not Applicable

Name	Fault Type	Length (km)	Time of most recent deformation	Recurrence Interval
Cedar Mountains faults (East Side)	Normal	5	<1,600,000 years ago	Unknown
Deep Creek faults	Normal	10	<1,600,000 years ago	Unknown
Deep Creek Range (Northwest Side) faults	Normal	11	<130,000 years ago	Unknown
Lookout Pass fault	Normal	4	<1,600,000 years ago	Unknown
Oquirrh fault zone	Normal	21	4,800-7,900 years ago	20,000 years
Saint John Station fault zone	Normal	5	<130,000 years ago	Unknown
Sheeprock fault zone	Normal	7	<1,600,000 years ago	Unknown
Silver Island Mountains (Westside) fault	Normal	6	<1,600,000 years ago	Unknown
Silver Island Mountains (Southside) fault	Normal	2	<15,000 years ago	Unknown
Simpson Mountains faults	Normal	11	<750,000 years ago	Unknown
Skull Valley faults (Mid-Valley)	Normal	55	<15,000 years ago	Unknown
Southern Oquirrh Mountains fault zone	Normal	24	4,400-4,800 years ago	20,000 years
Stansbury fault zone	Normal	50	6000-10,000 years ago	Unknown
Topliff Hill fault zone	Normal	20	<130,000 years ago	Unknown
Vernon Hills fault zone	Normal	3	<130,000 years ago	Unknown
Puddle Valley fault zone	Normal	7	<15,000 years ago	Unknown

Table 12-2. Quaternary Faults, Tooele County

1. Earthquake

Hazard Profile

<i>Potential Magnitude</i>	X	<i>Catastrophic (>50%)</i>	<i>Probability</i>		<i>Highly Likely</i>
		<i>Critical (25-50%)</i>		X	<i>Likely</i>
		<i>Limited (10-25%)</i>			<i>Possible</i>
		<i>Negligible (< 10%)</i>			<i>Unlikely</i>
<i>Location</i>	The Intermountain Seismic Belt, Wasatch and Magna Fault Zones, along with the Oquirrh Marginal and Six Mile Creek Fault Zones. Ground shaking will be felt throughout the entire county. Surface fault rupture can be felt in areas of known historic fault zones. Liquefaction can be expected in areas of high to moderate liquefaction potential.				
<i>Seasonal Pattern</i>	There is no seasonal pattern for earthquakes, they can occur at any time of the year or day during no, any, or all weather conditions.				
<i>Conditions</i>	Liquefaction Potential within high ground water table and soil that is comprised of old lakebed sediments. Historic movement along faults. Intermountain Seismic Zone, Wasatch Fault.				
<i>Duration</i>	Actual ground shaking will be under one minute, aftershocks can occur for weeks or even months.				
<i>Secondary Hazards</i>	Fire, landslide, rock falls, avalanche, flooding.				
<i>Analysis Used</i>	Review of hazard analysis plans and other information provided by the University of Utah Seismograph Station, UGS, USGS, DHLS, AGRC				

Description of Location and Extent

The primary earthquake threat to Tooele County is from the Wasatch Fault Zone. The Wasatch Fault Zone is an active fault zone that can produce a large 7.3-7.5 Richter magnitude earthquake on average every 300-400 years. The Salt Lake Segment of the Wasatch Fault Zone underlies the Salt Lake valley. The combined average repeat time for large earthquakes on any of the five central segments (Brigham City, Weber, Salt Lake City, Provo, and Nephi segments) of the Wasatch Fault zone is 350 years. The average repeat time on any single segment ranges from about 1,200-2,600 years. Previous major earthquakes on the five central segments range from 620 to 2,120 years ago.

The Oquirrh Fault Zone is the other primary threat for earthquakes affecting the County. The fault has an approximate recurrence interval of 20,000 years. Earthquakes up to Richter magnitude 7.0 are possible within the Oquirrh Fault Zone, but given its recurrence interval, earthquakes of this magnitude are not probable. Smaller earthquakes are more likely along this fault with Richter magnitudes around 6.0.

Map 12-2 (page 249) show the positions of historic earthquakes relative to fault groups. It is notable that no earthquake greater than 3.0 in Richter magnitude has occurred in the county in the past 45 years. Many of the recorded seismic events on the map are the result of mining operations and not true earthquakes.

One of the better measures of earthquake destruction potential is spectral acceleration. 0.2 spectral acceleration represents the frequency at which the most potential damage can occur in one- and two-story buildings, while 1.0 spectral acceleration represents the frequency at which taller buildings potentially will see greater damage. The potential forces exerted on buildings are shown as a percentage of the force of gravity with 100% equaling one times the force of gravity (Map 12-3, page 250).

Portions of Tooele County are located atop an ancient Lake Bonneville, the bed of which is made up of very weak soils. The area is also subject to shallow ground water and a relatively high earthquake threat. The secondary threat, liquefaction associated with an earthquake could have a significant impact on populated areas of northeastern Tooele County. For a further explanation of the liquefaction threat, see Map 12-4 (page 251). See also regional hazards identification section for further explanation of liquefaction.

Vulnerability Assessment

An earthquake vulnerability assessment for Tooele County was obtained from the modeling program Hazards United States – Multi-hazards (HAZUS-MH)**. The following numbers were based on a probabilistic 2500-year event with a Richter magnitude of 7.1 as well as an arbitrary 5.9 event located in close proximity to the county's most populated areas. These locations and magnitudes were chosen for their likelihood and proximity respectively. Default HAZUS-MH inventory for all infrastructure was used. (**For a more detailed explanation of the loss estimation methodology of HAZUS-MH MR2, please see Part VII or the HAZUS-MH Technical Manual (Earthquake Model) at www.fema.gov/hazus).

Building Damage

HAZUS-MH classifies building damage into five states: none, slight, moderate, extensive and complete. Table 12-3 lists the number of buildings by occupancy estimated to sustain moderate to complete levels of damage during either an arbitrary Richter magnitude 5.9 (M5.9) or a probabilistic Richter magnitude 7.1 (M7.1) earthquake. Also listed are the estimated monetary losses to structures, contents/inventory and income.

Category	Number of Structures with > 50% Damage		Category	Estimated Losses	
	Tooele M5.9	2500-yr M7.1		Tooele M5.9	2500-yr M7.1
Residential	4,698	4,898	Structural Losses	\$18,419,000	\$56,606,250
Commercial	54	109	Non-Structural Losses	\$66,291,000	\$192,654,880
Industrial	12	29	Content Losses	\$23,865,000	\$59,805,880
Government	4	9	Inventory Losses	\$673,000	\$2,235,650
Education	1	4	Income & Relocation Losses	\$18,145,000	\$49,560,420
Totals	4,769	5,049	Totals	\$127,393,000	\$360,863,080

Table 12-3. Building Damage Counts and Estimated Losses

Transportation and Utilities Damage

Damages to transportation and utility infrastructure are in Table 12-4. Infrastructure sustaining moderate or worse damage and estimated monetary losses are both shown.

Category	Total	At Least Moderate Damage >50%		Estimated Losses	
		Tooele M5.9	2500-yr M7.1	Tooele M5.9	2500-yr M7.1
Waste Water Facilities	3	1	2	\$14,367,000	\$51,777,000
Waste Water Pipelines	6,485 km	265 leaks/breaks	3,710 leaks/breaks	\$952,000	\$13,356,000
Potable Water Pipelines	10,808 km	333 leaks/breaks	4,691 leaks/breaks	\$1,204,000	\$16,887,000
Natural Gas Pipelines	4,323 km	257 leaks/breaks	3,966 leaks/breaks	\$1,018,000	\$14,277,000
Communication Facilities	4	0	2	\$16,000	\$86,000
Highway Bridges	54	1	20	\$295,000	\$10,002,000
Railway Bridges	1	0	0	\$0	\$0
Airport Facilities	4	4	0	\$1,129,000	\$4,228,000
Total Losses				\$18,981,000	\$110,613,000

Table 12-4. Damage to Transportation and Utilities

Debris Removal

Table 12-5 shows how much debris would be generated by the scenario earthquake and how many loads it would take to remove the debris, based on 25 tons per load. One truck can likely haul one load per hour. A second debris removal issue is landfill space. Fifty thousand tons at a weight-to-volume ratio of one ton per cubic yard would cover more than ten acres to a depth of three feet.

Category	Tooele M5.9	2500-yr M7.1
Brick, Wood & Others	24,000 tons / 960 loads	68,000 tons / 2,720 loads
Concrete & Steel	41,000 tons / 1,640 loads	132,000 tons / 5,280 loads

Table 12-5. Debris Generated/Number of Loads

Fire Following

Multiple ignitions and broken water mains following an earthquake can make firefighting nearly impossible. HAZUS-MH uses estimated building damages, loss of transportation infrastructure and estimated winds to calculate the estimated area that would be burned following an earthquake. Table 12-6 provides estimates of ignitions, people at risk and the building stock exposed to fires following an earthquake.

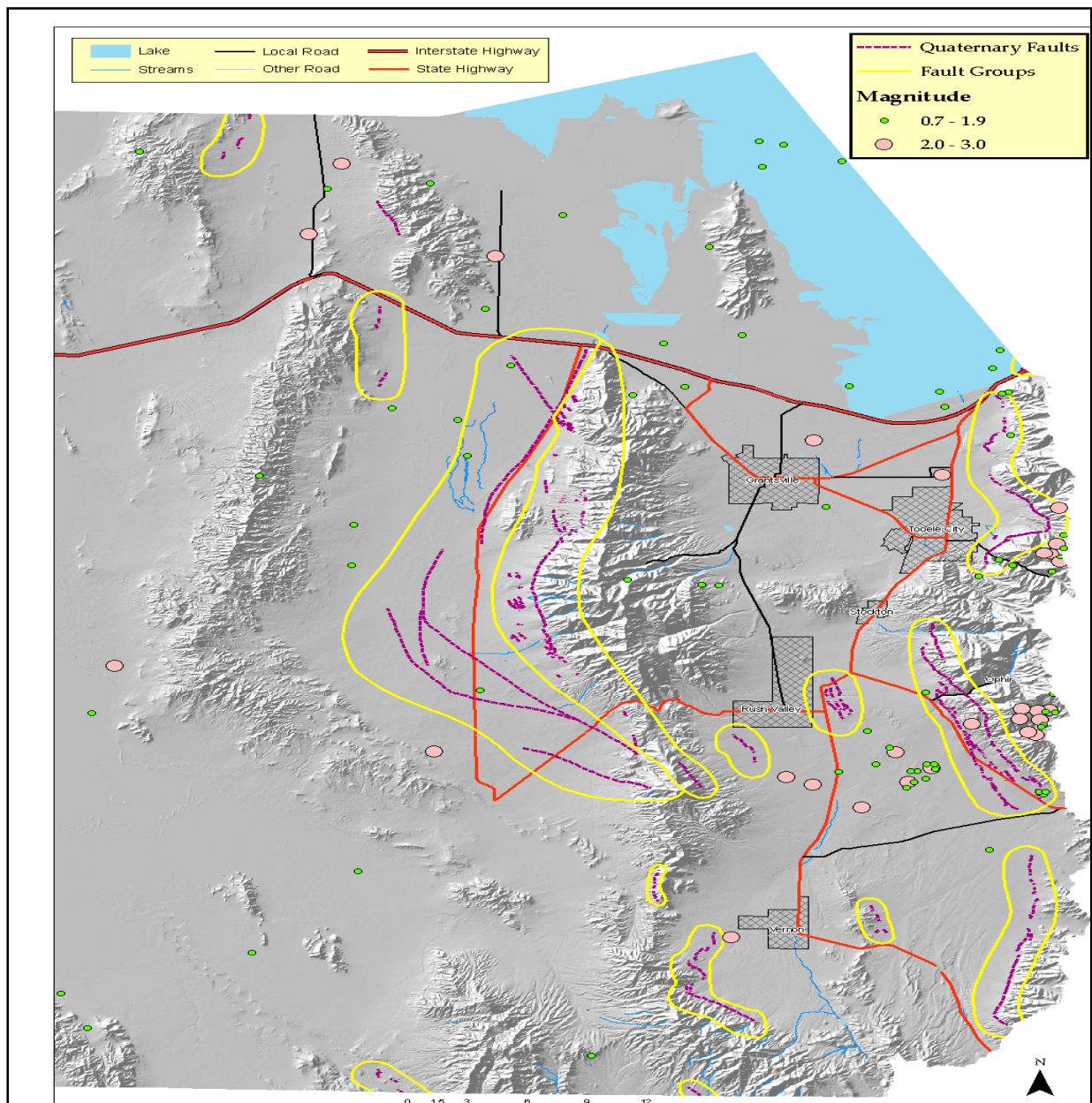
Category	Number of Structures	
	Tooele M5.9	2500-yr M7.1
Ignitions	1	3
Persons Exposed	49	64
Value Exposed	\$2,365,000	\$3,114,000

Table 12-6. Fire Following Event, Population Exposed, and Building Stock Exposed

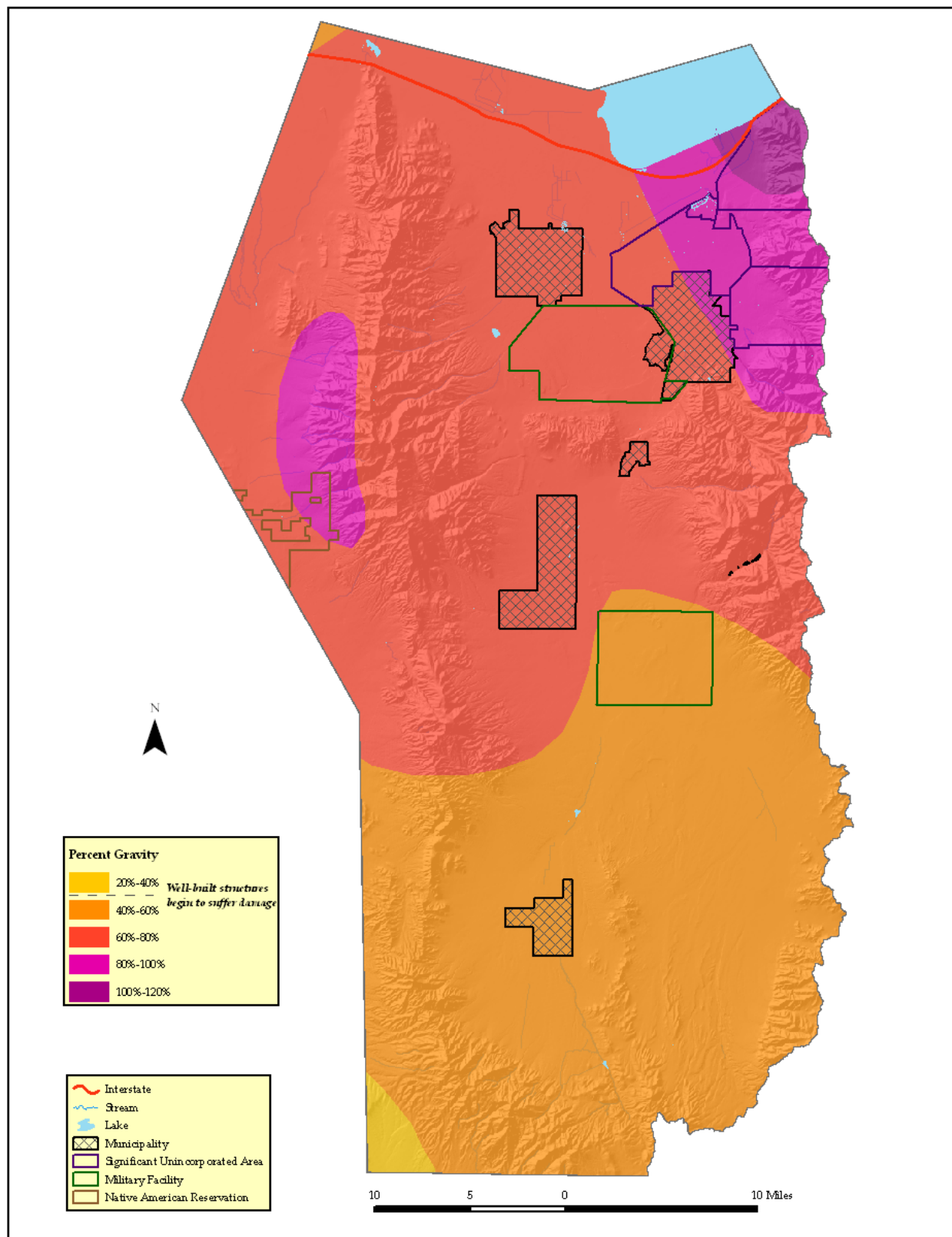
Casualties

Table 12-7 estimates casualties likely to occur during each earthquake scenario. The nighttime scenario (2 a.m. local time) assumes a primarily residential concentration of persons, the daytime scenario (2 p.m. local time) a commercial concentration, and the commute scenario (5 pm. local time) a concentration of persons on commuting routes. Categories of casualties include those not requiring hospitalization (minor), those requiring treatment at a medical facility (major) and fatalities.

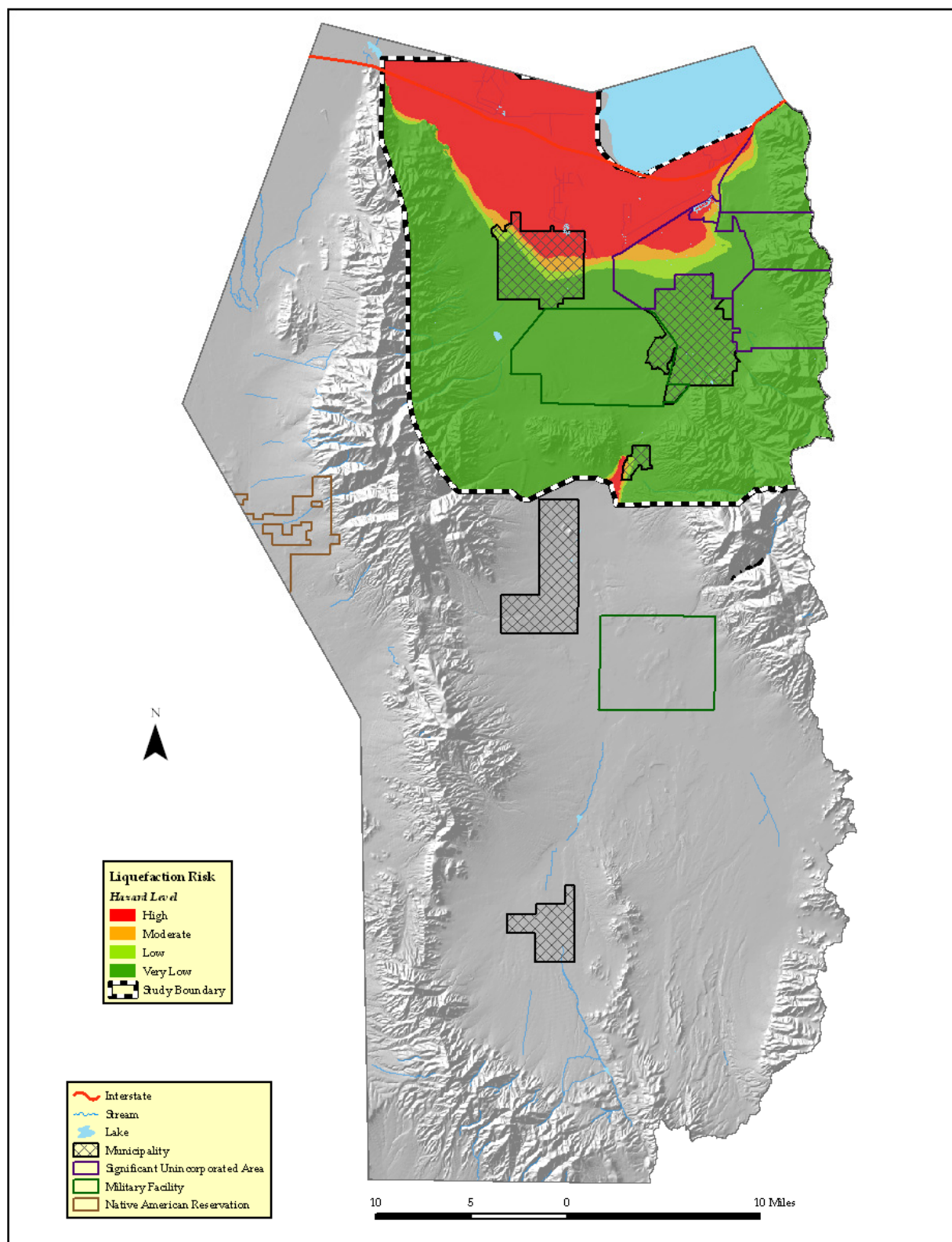
Night Event	Tooele 5.9	2500-yr 7.1	Day Event	Tooele 5.9	2500-yr 7.1	Commute Event	Tooele 5.9	2500-yr 7.1
Minor	52	184	Minor	58	209	Minor	49	179
Major	11	50	Major	16	67	Major	13	56
Fatalities	2	11	Fatalities	4	18	Fatalities	3	14
Table 12-7. Casualties								



Map 12-2. Historical Earthquake Epicenters, Eastern Tooele County (Source: UUSS)



Map 12-3 Ground Shaking Potential, Eastern Tooele County (Source: National Seismic Hazards Mapping Program)



Map 12-4 Liquefaction Potential, Eastern Tooele County (USS)

Wildland Fire

Hazard Profile

<i>Potential Magnitude</i>		<i>Catastrophic (>50%)</i>	<i>Probability</i>		<i>Highly Likely</i>
	X	<i>Critical (25-50%)</i>		X	<i>Likely</i>
		<i>Limited (10-25%)</i>			<i>Possible</i>
		<i>Negligible (< 10%)</i>			<i>Unlikely</i>
<i>Location</i>	Wildland-Urban Interface (WUI) zones near the foothills and in forested areas. See Map 12-5 (page 255).				
<i>Seasonal Pattern</i>	Summer months.				
<i>Conditions</i>	Areas affected by drought and/or heavily overgrown; dry brush and debris; lightning and human triggers.				
<i>Duration</i>	Wildfires typically last days but can last months, depending on climate and fuel load as well as resources (financial, manpower) to extinguish the fire.				
<i>Secondary Hazards</i>	Landslides, debris flows, erosion, traffic accidents, air pollution.				
<i>Analysis Used</i>	Review of plans and data provided by U.S. Forest Service, National Climate Center, FEMA, AGRC, County Hazard Analysis Plans, and the DHLS.				

Description of Location and Extent

Potential wildfire hazard within Tooele County is growing as population growth is spreading into the wildland-urban interface (WUI). Over the past 10 years urban sprawl has encroached upon forested foothill areas and wildland areas threatening life and property.

The wildfire threat in Tooele County in the past has had a significant effect on the watersheds, including landslides, debris flows and other forms of erosion. Federal, state and local agencies have worked together to enforce ordinances and other programs such as re-vegetation zones to protect watersheds.

Wildland fire risk for Tooele County can be found in Map 12-5 (page 255). The map layers were provided by the Utah Division of Forestry, Fire, and State Lands and show four categories of wildfire risk (Extreme, High, Medium and Low). These ratings cover all of Tooele County and are based on the type and density of vegetation in each area as well as vulnerable population. Additional factors that influence wildfires (weather conditions, wind speed and direction) are not considered in this risk assessment.

The entire county is at moderate or greater risk for wildfires. Areas potentially affected include: Loftgreen, Vernon, Ophir, Deseret Chemical Depot, Rush Valley, Terra, Dugway Proving Grounds, Skull Valley Reservation, Stockton, Tooele Army Depot, Pine Canyon, Grantsville and Erda.

Development has been advancing further and further into the WUI, with many of the most vulnerable homes also the most costly to replace. Without effective fuel reduction measures and sufficient defensible space, these areas are likely to see considerable losses.

Vulnerability Assessment

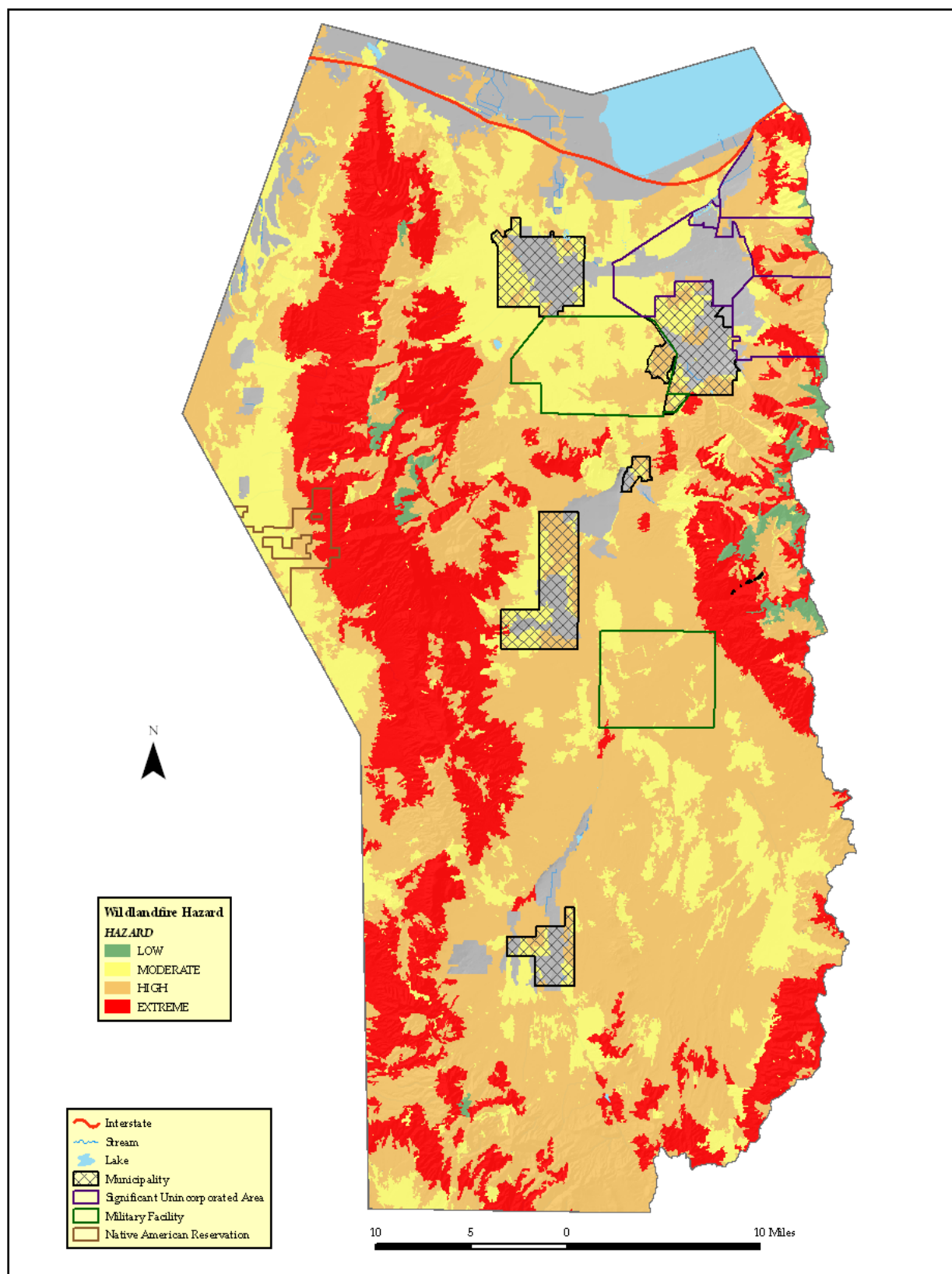
Table 12-8 (below) estimates the total area, population, and buildings vulnerable to wildland fire for individual cities and unincorporated areas. Table 12-9 (next page) estimates infrastructure vulnerable to wildland fire in Tooele County. Provided are the number of units or total length of infrastructure vulnerable and the estimated replacement costs as provided by HAZUS-MH lost estimation software.

Incorporated Areas	Acres Affected	Population Affected	Structures in Areas of Moderate or Greater Hazard	
			Residential (Replacement Value)	Commercial (Annual Sales)
Grantsville	1,593	88	45 \$6,421,250	0 \$0
Ophir	37	0	0 \$0	0 \$0
Rush Valley	4,562	55	37 \$3,879,050	0 \$0
Stockton	585	162	75 \$10,013,750	2 \$1,559,791
Tooele	6,572	2,798	1,807 \$309,160,550	34 \$87,870,040
Vernon	14,801	28	7 \$10,851,450	0 \$0
Wendover	0	0	0 \$0	0 \$0

Unincorporated Areas	Acres Affected	Population Affected	Structures in Areas of Moderate or Greater Hazard	
			Residential (Replacement Value)	Commercial (Annual Sales)
Deseret Chemical Depot	3,286	0	1 \$148,650	0 \$0
Dugway Proper	3,316	0	0 \$0	0 \$0
Erda	14,224	0	35 \$2,232,750	2 \$1,600,000
Goshute Reservation	150	59	12 \$1,768,935	0 \$0
Lakepoint	13,052	0	0 \$0	0 \$0
Pine Canyon	12,560	29	42 \$6,243,800	0 \$0
Skull Valley Reservation	15,445	87	20 \$3,017,595	0 \$0
Tooele Army Depot	42,496	0	0 \$0	0 \$0
Stansbury Park	0	0	0 \$0	0 \$0

Table 12-8. Vulnerability Assessment for Wildland Fire, Tooele County

Item	Length (Miles) or Number of Units	Replacement Cost
Highways/Interstates	179.20 miles	\$998,352,407
Highway Bridges	54 bridges	\$68,781,340
Railway Segments	237.14 miles	\$272,415,587
Railway Bridges	1 bridge	\$44,100
Water Distribution Lines	N/A	N/A
Gas Lines	N/A	N/A
Sewer Lines	N/A	N/A
Total Estimated Infrastructure Replacement Cost		\$1,339,593,434
Table 12-9. Infrastructure Vulnerable to Wildland Fire, Tooele County		



Map 12-5. Wildfire Hazard, Eastern Tooele County (UDFFSL 2007)

3. Slope Failure

Hazard Profile

<i>Potential Magnitude</i>		<i>Catastrophic (>50%)</i>	<i>Probability</i>		<i>Highly Likely</i>
		<i>Critical (25-50%)</i>		X	<i>Likely</i>
	X	<i>Limited (10-25%)</i>			<i>Possible</i>
		<i>Negligible (< 10%)</i>			<i>Unlikely</i>
<i>Location</i>	Generally, landslides, debris flows, and rock falls occur in canyon mouths and foothill areas. Areas of recent wildfire activity also pose landslide danger. See Map 12-6 (page 258).				
<i>Seasonal Pattern</i>	Spring and summer months.				
<i>Conditions</i>	Usually caused by the stress release of over-weighted soils and or loosening of rock and debris by wind, water, or ground shaking.				
<i>Duration</i>	Landslides generally last hours or days, but some can last weeks. Rock falls and debris flows are instantaneous.				
<i>Seasonal Hazards</i>	Flooding (natural dams), traffic accidents.				
<i>Analysis Used</i>	Information and maps provided by UGS, DHLS, AGRC.				

Description of Location and Extent

Slope failure in Tooele County comes primarily in the form of debris flows. The County has a high wildfire hazard. These wildfires denude slopes of anchoring vegetation. Heavy rainstorms following these wildfires fall on the denuded slopes and loosen the soils. These factors can combine to form a wall of water, rocks, and mud which smash into nearby homes. Many of these debris flows occur in canyon mouths forming alluvial fans.

Recent debris flows in Tooele County include Flux (1983-84), South Mountain (1983-84), Stockton (1983-84), Bingham (1993-1994), Lake Point (1983-84, 2000), and Grantsville (2007) (UGS Survey Notes 35-1, UGS Open File Report 318). Most of these debris flows have caused less than \$50,000 in damages.

There are only a few areas with landslide risk in Tooele County. On the west side of the Stansbury Mountains, near the Skull Valley Native American Reservation, a small area of landslides can be found in Deadman Canyon and Barlow Hollow. Another small area of landslides is located in Ophir Canyon near the town of Ophir. These landslide areas affect little or no population. For more information on the landslide hazard in Tooele County, please see Map 12-6 (page 258).

Vulnerability Analysis

Table 12-10 (page 257) estimates the total area, population, and buildings vulnerable to landslides for individual cities and unincorporated areas. Table 12-11 estimates infrastructure vulnerable to landslides in Tooele County. Provided are the number of units or total length of infrastructure vulnerable and the estimated replacement costs as provided by HAZUS-MH loss estimation software.

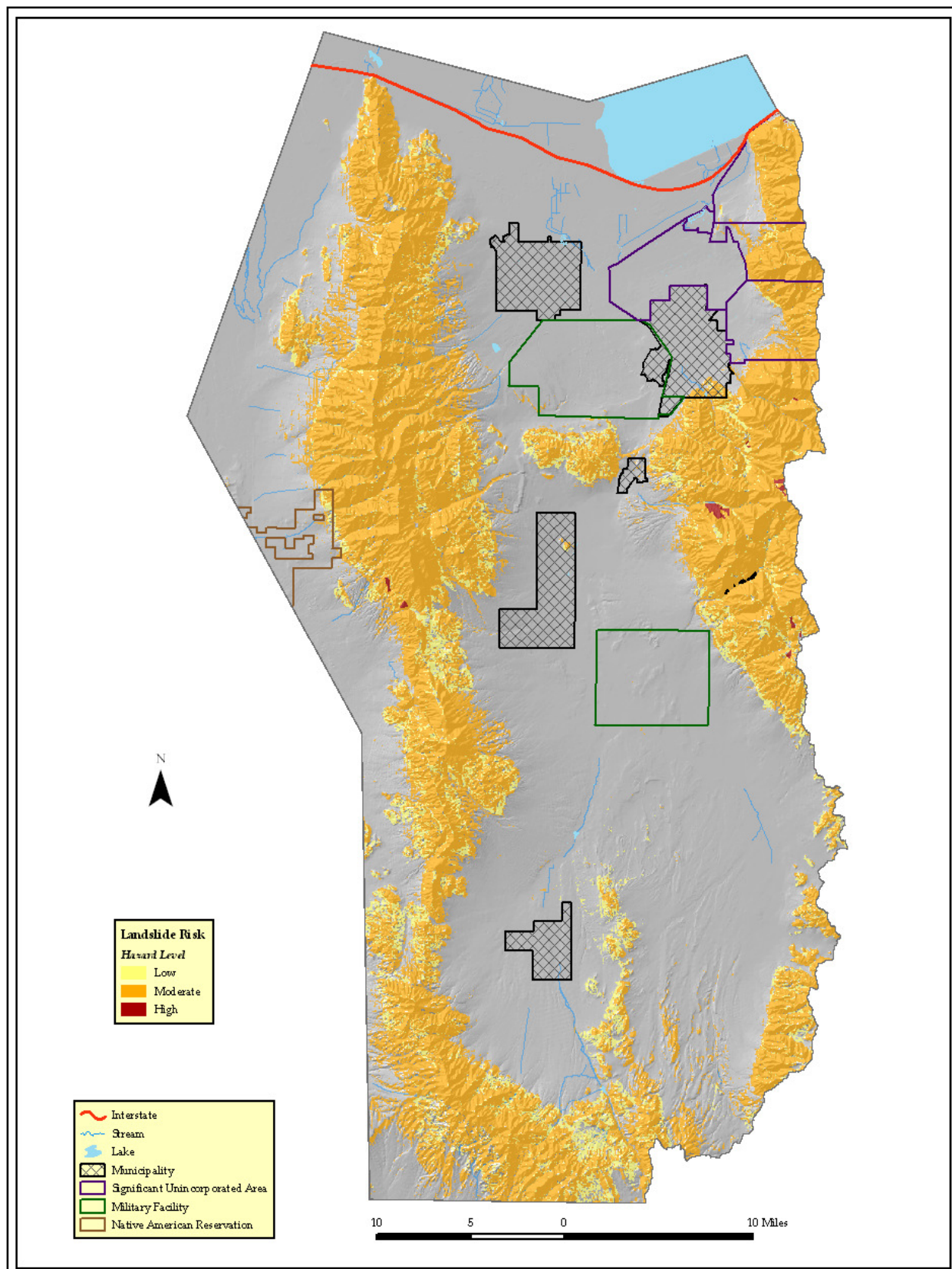
Incorporated Areas	Acres Affected	Population Affected	Structures in Areas of Moderate or Greater Hazard	
			Residential (Replacement Value)	Commercial (Annual Sales)
Grantsville	0	0	0 \$0	0 \$0
Ophir	34	144	55 \$8,175,750	0 \$0
Rush Valley	75	1	0	0
Stockton	89	64	24 \$3,567,600	1 \$68,622
Tooele	729	343	123 \$18,283,950	0 \$0
Vernon	0	0	0	0
Wendover	541	204	50 \$7,447,365	0 \$0

Unincorporated Areas	Acres Affected	Population Affected	Structures in Areas of Moderate or Greater Hazard	
			Residential (Replacement Value)	Commercial (Annual Sales)
Deseret Chemical Depot	0	0	0	0
Dugway Proper	195	162	20 \$2,973,000	0 \$0
Erda	28	4	1 \$148,650	0 \$0
Goshute Reservation	0	0	0 \$0	0 \$0
Lakepoint	7,935	96	33 \$4,905,450	0 \$0
Pine Canyon	5,364	170	79 \$11,743,350	0 \$0
Skull Valley Reservation	625	22	5 \$0	0 \$0
Tooele Army Depot	0	0	0	0
Stansbury Park	0	0	0	0

Table 12-10. Vulnerability Assessment for Landslides, Tooele County

Item	Length (Miles) or Number of Units	Replacement Cost
Highways/Interstates	4.30 miles	\$22,191,835
Highway Bridges	5 bridges	\$4,565,620
Railway Segments	4.80 miles	\$5,507,886
Railway Bridges	0 bridges	\$0
Water Distribution Lines	982.89 miles	\$31,636,250
Gas Lines	393.14 miles	\$12,654,475
Sewer Lines	589.68 miles	\$18,981,731
Total Estimated Infrastructure Replacement Cost		\$95,537,797

Table 12-11. Infrastructure Vulnerable to Landslides, Tooele County



Map 12-6. Landslide Susceptibility, Eastern Tooele County (Source: USGS)

4. Flood

Hazard Profile

Potential Magnitude		Catastrophic (>50%)	Probability		Highly Likely
		Critical (25-50%)			Likely
	X	Limited (10-25%)		X	Possible
		Negligible (< 10%)			Unlikely
Location	Canyons, alluvial fans, Great Salt Lake (See Map 12-7, page 262).				
Frequency	Spring, late summer.				
Conditions	Cloudburst storms, rapid snowmelt, extended wet periods.				
Duration	Flooding can last anywhere from hours to days and even months.				
Secondary Hazards	Raw sewage/health risk, electrical fires, gas spills.				
Analysis Used	Review of FIRM, flood insurance studies, debris flow maps.				

Description of Location and Extent

Flooding in Tooele County is associated primarily with heavy rainfall from cloudburst storms and from lake flooding around the Great Salt Lake. Stream flooding is limited due to the desert climate. Most streams in the County are intermittent. Intermittent stream water usually flows only after intense, short-duration rain events. Eastern areas of the county see sustained flows from spring and summer snowmelt.

Current flood insurance rate maps (FIRMS) exist only for the communities of Tooele City, Rush Valley, Stockton and Wendover. These maps haven't been updated in several years making the accuracy of the data suspect given the significant amount of recent development in the County. Floodplain information from these maps can be found in Map 12-7. Much of the flood hazards present in the maps are in the form of alluvial fans/debris flows. These flood events occur with the aforementioned short duration, heavy rainfall events. These flood events can be compounded if the heavy precipitation event causes rapid snowmelt during the spring months.

Lake flooding can occur along the Great Salt Lake (GSL) and in the West Desert. During the flood event of 1983-1984, much of the area near Lake Point was flooded by the GSL. The operation of the west desert pumping station resulted in an inundation of a large area of the west desert. During periods of excessive precipitation, areas of the west desert and Bonneville Speedway are often underwater.

Vulnerability Assessment

The vulnerability assessment for flooding in Tooele County was obtained from HAZUS-MH**. Data was taken from Flood Insurance Rate Maps (FIRM) or Digital Flood Insurance Rate Maps (DFIRM). Only streams which contained detailed flood cross-section data could be used. Vulnerability was assessed for 100-year (NFIP Zone A) floods only in Tooele City. Cross-sections not were available at the 500-year elevation. As well, flooding from the Great Salt Lake was not included. Consequently, the results should be considered conservative. Total monetary losses include structures, contents and business interruption. (**For a more detailed explanation of the loss estimation methodology of HAZUS-MH MR2, please see Part VII or the HAZUS-MH Technical Manual (Flood Model) at www.fema.gov/hazus.)

	Acres Flooded	Population Displaced	Number of Structures with at Least Moderate Damage	
			<i>Residential Units (Total Losses)</i>	<i>Commercial/Industrial Units (Total Losses)</i>
100-year Flood	71.3	153	9 \$2,280,000	0 \$750,000
500-year Flood	-	-	-	-

Table 12-12. Tooele City Flood Hazard

Agricultural Losses

Agricultural losses are listed in Table 12-13. Losses are computed according to the number of days in which the crops are inundated with water. All numbers are estimated for a flood occurring near April 15th.

	100-year Losses Day 3	100-year Losses Day 7	500-year Losses Day 3	500-year Losses Day 7
Barley	\$1,014	\$1,352	-	-

Table 12-13. Agricultural Losses, April 15th Scenario

Vehicle Losses

Table 12-14 contains losses for vehicles in floods during both daytime and nighttime scenarios. The scenarios assume ninety percent (90%) of vehicles being removed from hazard areas due to warning.

Category	100-year	500-year
Daytime Scenario	\$72,344	
Nighttime Scenario	\$168,241	

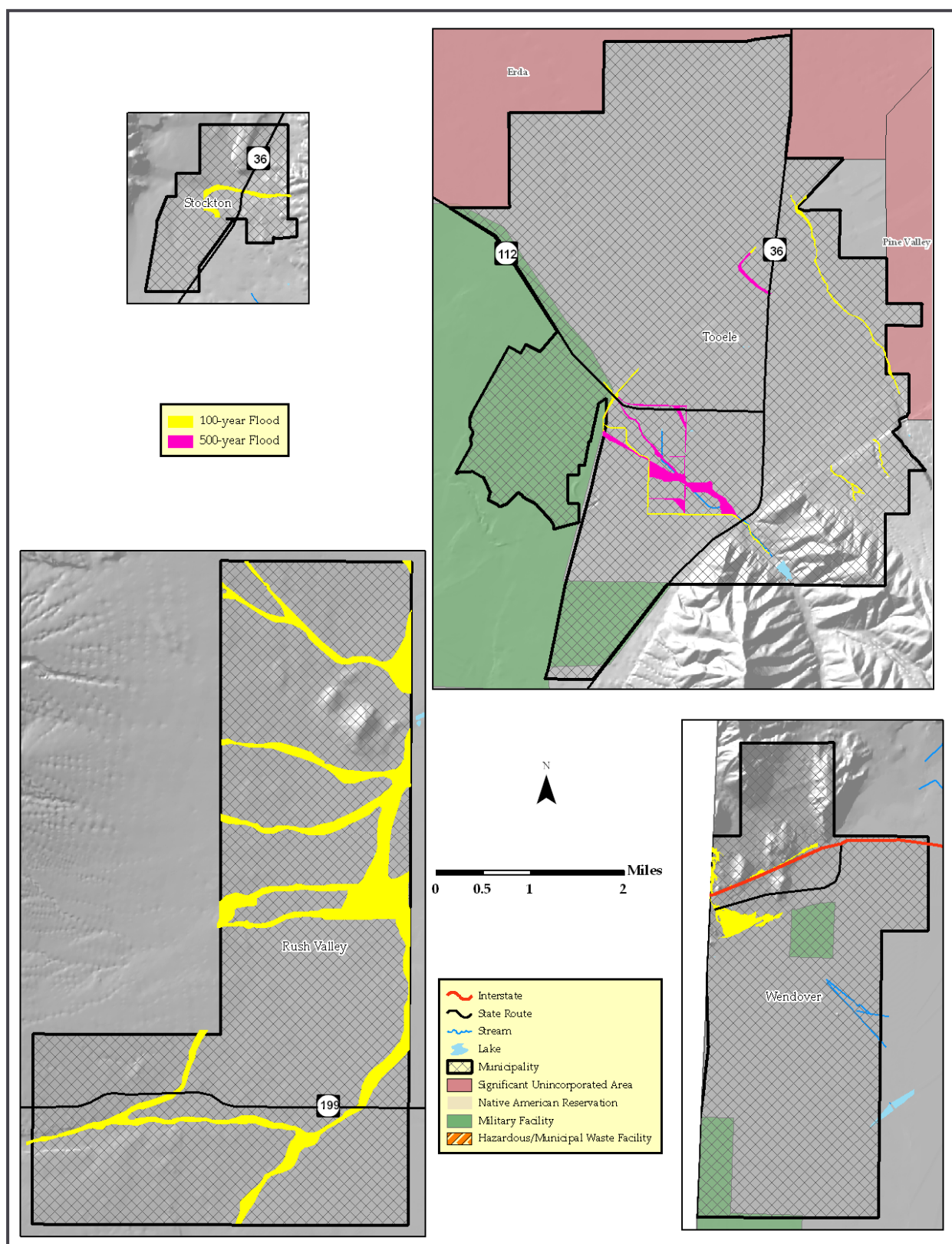
Table 12-14. Vehicle Losses

Debris Removal

Table 12-15 shows how much debris would be generated by flooding and how many loads it would take to remove the debris, based on a capacity of 25 tons per load. One truck can likely haul one load per hour. A second debris removal issue is landfill space. Fifty thousand tons at a weight-to-volume ratio of one ton per cubic yard would cover more than ten acres to a depth of three feet.

Category	100-year	500-year
Finishes	225 tons/9 loads	
Structures	114 tons/5 loads	
Foundations	128 tons/6 loads	
Totals	467 tons/20 loads	

Table 12-15. Debris Generation and Removal



Map 12-7. 100-year and 500-Year Floodplains, Tooele County (NFIP 1990b)

4. Dam Failure

Hazard Profile

Potential Magnitude		Catastrophic (>50%)	Probability		Highly Likely
	X	Critical (25-50%)			Likely
		Limited (10-25%)		X	Possible
		Negligible (< 10%)			Unlikely
Location	See Map 12-8 (page 266).				
Frequency	Rainy Day Failure: Spring, Late Summer. Sunny Day Failure: Anytime.				
Conditions	Rainy-day failure happens mainly during heavy precipitation events, and can have some warning time. Sunny day failure happens with no warning at all, usually from sudden structural failure.				
Duration	Hours – Days.				
Secondary Hazards	Raw sewage/health risk, electrical fires, gas spills.				
Analysis Used	Review of BOR inundation maps and plans, FIS, and the Utah Division of Water Rights.				

Description of Location and Extent

Sixty-nine (69) dams are located in Tooele County, two (2) of which are listed as a high hazard threat. Meaning, if they fail, they have a high probability of causing loss of life and extensive economic loss. Four (4) dams are listed as a moderate hazard threat meaning if they fail they have a low probability of causing loss of life. Both threats would cause appreciable property damage and mitigation efforts should be developed and pursued. Fifty-eight (58) dams have a low hazard threat, meaning if they were to fail there would be a minimal threat to life and economic losses would be minor and the damage would be limited to the owner of the dam. However they should still be monitored. No hazard rating is provided for five (5) dams.

It should be noted that Dam Safety hazard classifications are in the event of the failure of a dam, based upon the consequences of failure of the dam given by the State Engineer. Therefore, the classification of a high hazard dam does not mean that the dam has a high probability of failure.

Name	Rating	Name	Rating
Grantsville	High	G & L Ranch 87R114	Moderate
Settlement Canyon	High	Grantsville Regulating Pond	Moderate
Buzianis DB	Moderate	Vernon	Moderate
Table 12-16. High and Moderate Hazard Dams, Tooele County (Utah Division of Water Rights 2007)			

Vulnerability Assessment

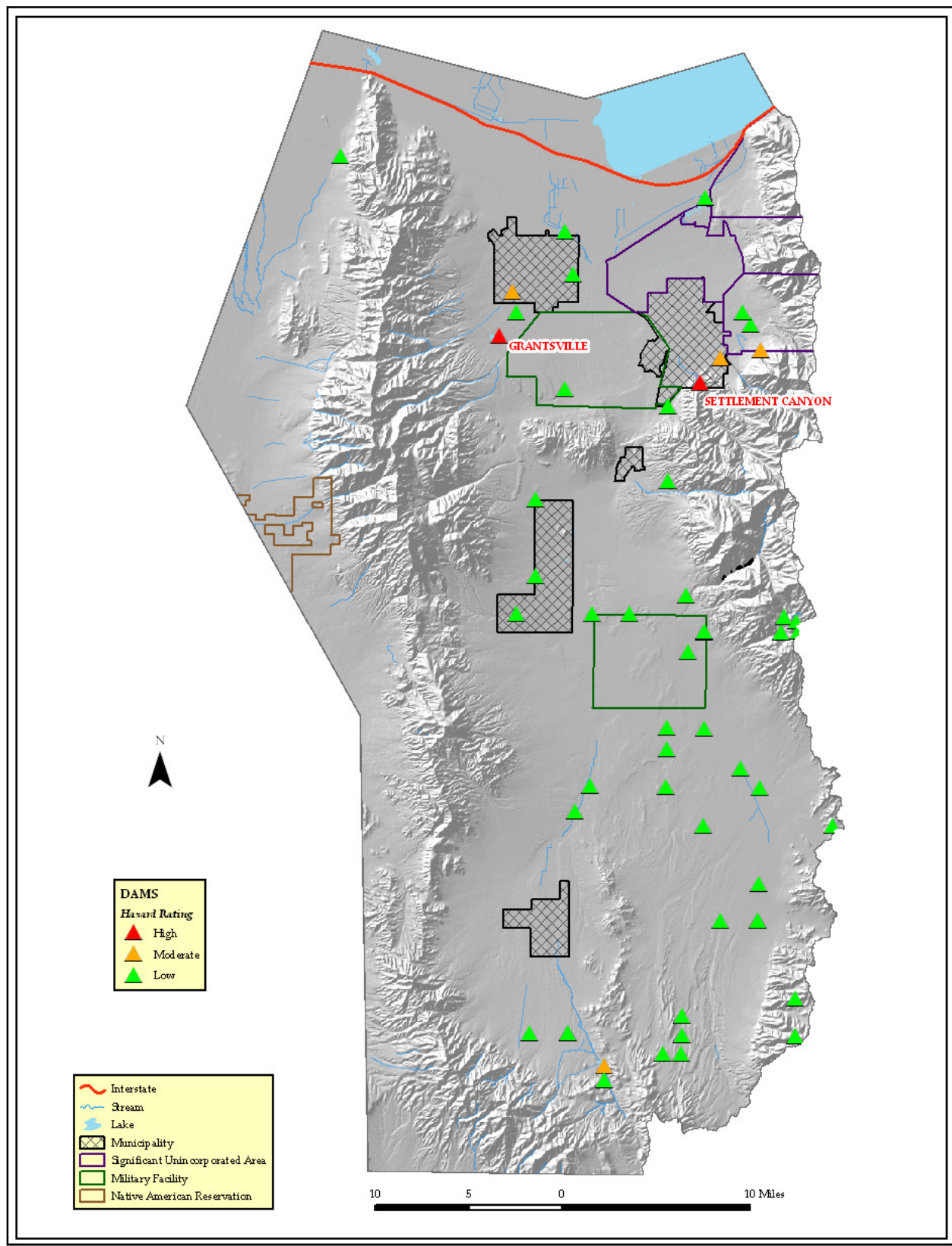
Table 12-17 (below) estimates the total area, population and buildings vulnerable to dam failure for individual cities and unincorporated areas. Table 12-18 (page 265) estimates infrastructure vulnerable to dam failure in Tooele County. Provided are the number of units or total length of infrastructure vulnerable and the estimated replacement costs as provided by HAZUS-MH loss estimation software.

Incorporated Areas	Acres Affected	Population Affected	Structures in Areas of Moderate or Greater Hazard	
			Residential (Replacement Value)	Commercial (Annual Sales)
Grantsville	2,538	1,457	504 \$74,919,600	22 \$5,917,650
Ophir	0	0	0	0
Rush Valley	0	0	0	0
Stockton	0	0	0	0
Tooele	9,253	15,944	5,335 \$793,047,750	449 \$270,466,412
Vernon	268	11	4 \$594,600	0 \$0
Wendover	0	0	0	0

Unincorporated Areas	Acres Affected	Population Affected	Structures in Areas of Moderate or Greater Hazard	
			Residential (Replacement Value)	Commercial (Annual Sales)
Deseret Chemical Depot	0	0	0 \$0	0 \$0
Dugway Proper	0	0	0 \$0	0 \$0
Erda	6,661	3,259	964 \$143,298,600	5 \$1,976,328
Goshute Reservation	0	0	0	0
Lakepoint	0	0	0	0
Pine Canyon	0	0	0	0
Skull Valley Reservation	0	0	0	0
Tooele Army Depot	5,742	1,862	560 \$83,244,000	84 \$39,441,047
Stansbury Park	0	0	00	0

Table 12-17. Vulnerability Assessment for Dam Failure, Tooele County

Item	Length (Miles) or Number of Units	Replacement Cost
Highways/Interstates	20.36 miles	\$104,368,536
Highway Bridges	1 bridge	\$2,547,463
Railway Segments	23.67 miles	\$27,185,660
Railway Bridges	0 bridges	\$0
Water Distribution Lines	N/A	N/A
Gas Lines	N/A	N/A
Sewer Lines	N/A	N/A
Total Estimated Infrastructure Replacement Cost		\$134,101,659
Table 12-18. Infrastructure Vulnerable to Dam Failure, Tooele County		



Map 12-8. Dams and Associated Risk Levels, Eastern Tooele County (Utah Division of Water Rights 2007)

5. Problem Soils

Hazard Profile

<i>Potential Magnitude</i>		<i>Catastrophic (>50%)</i>	<i>Probability</i>		<i>Highly Likely</i>
		<i>Critical (25-50%)</i>			<i>Likely</i>
	X	<i>Limited (10-25%)</i>		X	<i>Possible</i>
		<i>Negligible (< 10%)</i>			<i>Unlikely</i>
<i>Location</i>	See Map 12-9 (page 269).				
<i>Frequency</i>	Continuous.				
<i>Conditions</i>	Conditions vary by geologic formation.				
<i>Duration</i>	Minutes to years.				
<i>Secondary Hazards</i>	Flooding (broken water pipes), fire (broken gas pipes).				
<i>Analysis Used</i>	Utah Geological Survey.				

Description of Location and Extent

Problem soils are soils that present problems for buildings and other engineered structures. Four types of problem soils are present in Tooele County – limestone (karst), gypsum dunes, silica dunes and oolitic dunes. See Map 12-9 for more information on the locations of problem soils in Tooele County.

Limestone karst structures are easily eroded by water and therefore often form caverns and crevices. If these caverns become large enough, the overlying ground can give way causing sink holes and other forms of subsidence. Structures directly over the karst structure have a high potential for collapse. Ground water contamination is also possible (Mulvey 1992). Ophir is the only area affected by karst structures in Tooele County and is sparsely populated.

Three types of dunes exist in Tooele County: gypsum, silica and oolitic. All three have the potential to cause problems. These problems center mainly on their inability to adequately filter wastewater and clog septic systems (Mulvey 1992). Fortunately, most of these problem soils are located in the central and western portions of the County do not affect any populated areas.

Vulnerability Assessment

Table 12-19 (page 268) estimates the total area, population, and buildings vulnerable to problem soils for individual cities and unincorporated areas. Table 12-20 estimates infrastructure vulnerable to problem soils in Tooele County. Provided are the number of units or total length of infrastructure vulnerable and the estimated replacement costs as provided by HAZUS-MH loss estimation software.

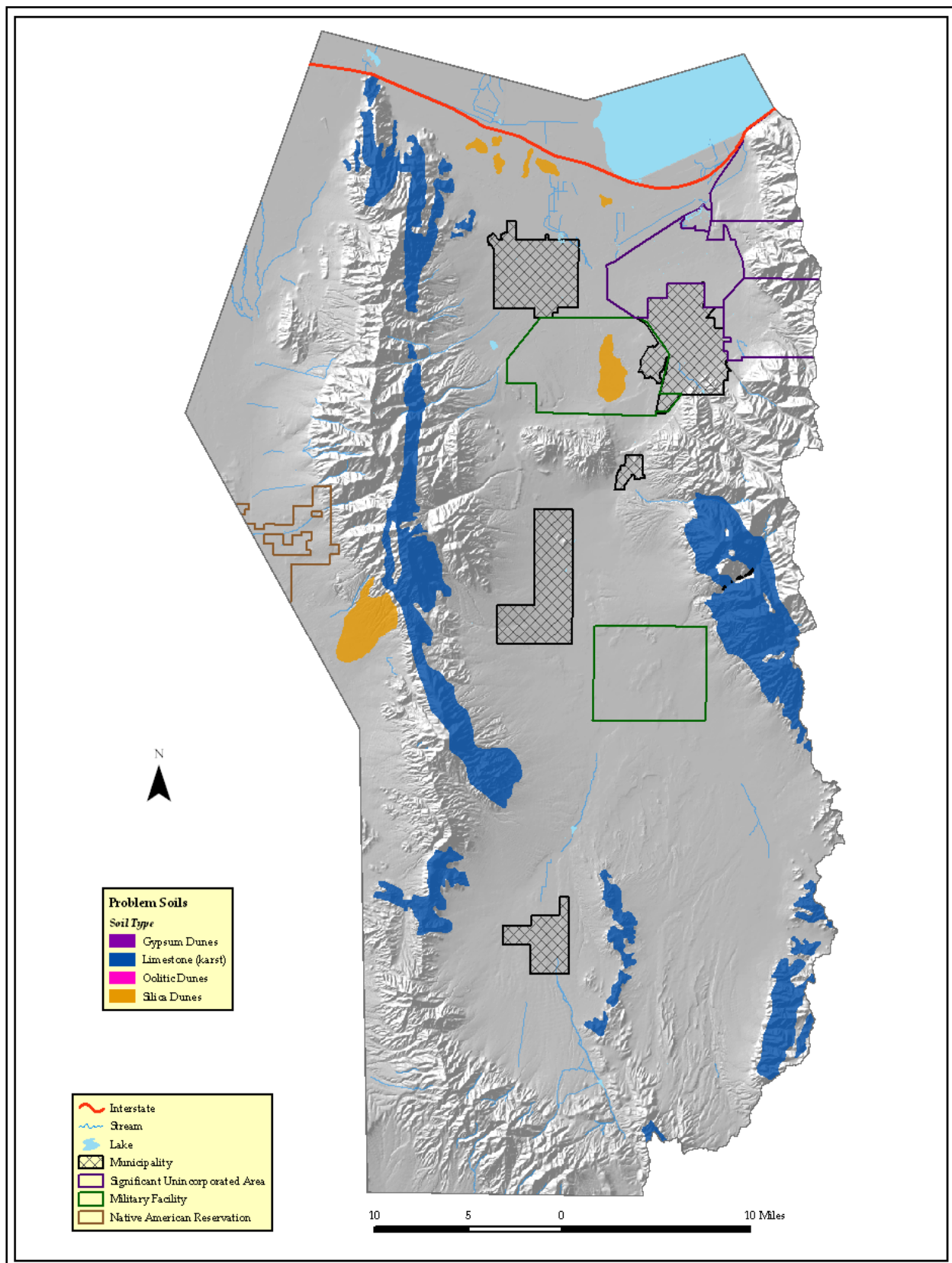
Incorporated Areas	Acres Affected	Population Affected	Structures in Areas of Moderate or Greater Hazard	
			Residential (Replacement Value)	Commercial (Annual Sales)
Grantsville	0	0	0 \$0	0 \$0
Ophir	66	79	30 \$4,459,500	0 \$0
Rush Valley	0	0	0 \$0	0 \$0
Stockton	0	0	0 \$0	0 \$0
Tooele	0	0	0 \$0	0 \$0
Vernon	0	0	0 \$0	0 \$0
Wendover	0	0	0 \$0	0 \$0

Unincorporated Areas	Acres Affected	Population Affected	Structures in Areas of Moderate or Greater Hazard	
			Residential (Replacement Value)	Commercial (Annual Sales)
Deseret Chemical Depot	1,131	0	0 \$0	0 \$0
Dugway Proper	0	0	0 \$0	0 \$0
Erda	0	0	0 \$0	0 \$0
Goshute Reservation	0	0	0 \$0	0 \$0
Lakepoint	0	0	0 \$0	0 \$0
Pine Canyon	0	0	0 \$0	0 \$0
Skull Valley Reservation	0	0	0 \$0	0 \$0
Tooele Army Depot	2,255	0	0 \$0	3 \$2,627,261
Stansbury Park	0	0	0 \$0	0 \$0

Table 12-19. Vulnerability Assessment for Problem Soils, Tooele County

Item	Length (Miles) or Number of Units	Replacement Cost
Highways/Interstates	11.94 miles	\$73,491,301
Highway Bridges	0 bridges	\$0
Railway Segments	12.26 miles	\$14,078,115
Railway Bridges	0 bridges	\$0
Water Distribution Lines	480.86 miles	\$15,477,370
Gas Lines	192.34 miles	\$6,190,937
Sewer Lines	288.52 miles	\$9,286,413
Total Estimated Infrastructure Replacement Cost		\$118,524,136

Table 12-20. Infrastructure Vulnerable to Problem Soils, Tooele County



Map 12-9. Problem Soils, Eastern Tooele County (Source: Utah Geological Survey)

Hazards and Future Development

Population Estimates									
County	2000 Pop (July 1)	2006 Pop (est.)	Absolute Change 2000-2006	% Change 2000-2006	AARC 2000-2006	Rank by 2000 Pop	Rank by Absolute Change	Rank by % Change	Rank by AARC
Tooele County	41,549	54,375	12,826	30.9%	4.6%	8	7	3	3
Population by County and Multi-County District									
MCD/ County	1980	1990	2000	2010	2020	2030	2040	2050	AARC 2000-2050
Wasatch Front	941,172	1,104,356	1,389,252	1,665,238	1,966,372	2,207,282	2,429,057	2,654,682	1.3%
Tooele County	26,033	26,601	41,549	67,150	95,696	112,722	130,092	148,486	2.6%
Households by County and Multi-County District									
MCD/ County	1980	1990	2000	2010	2020	2030	2040	2050	AARC 2000-2050
Wasatch Front	298,700	357,257	446,844	565,333	679,589	780,369	870,671	960,756	1.5%
Tooele County	7,966	8,581	12,931	21,700	31,754	38,441	45,331	52,477	2.9%
Table 11-21. Demographic and Economic Projections (UPEC 2007, 2008) All statistics are based on July 1 snapshot. AARC = Average Annual Rate of Change)									

Tooele County development trends have recently slowed with some new developments stalled. Development that is still occurring is in the northeastern portions of the County because housing and land values are slightly lower than nearby Salt Lake County. Development is occurring mostly on land formerly used for agriculture. The Oquirrh and Stansbury mountain ranges and the Great Salt Lake restrain development in the Tooele and Rush valleys. Hazardous waste disposal and federal lands restrict development in the central portion of the County. The western end of the County is salt flats and federal lands with the exception of the Wendover area on the Nevada-Utah border.

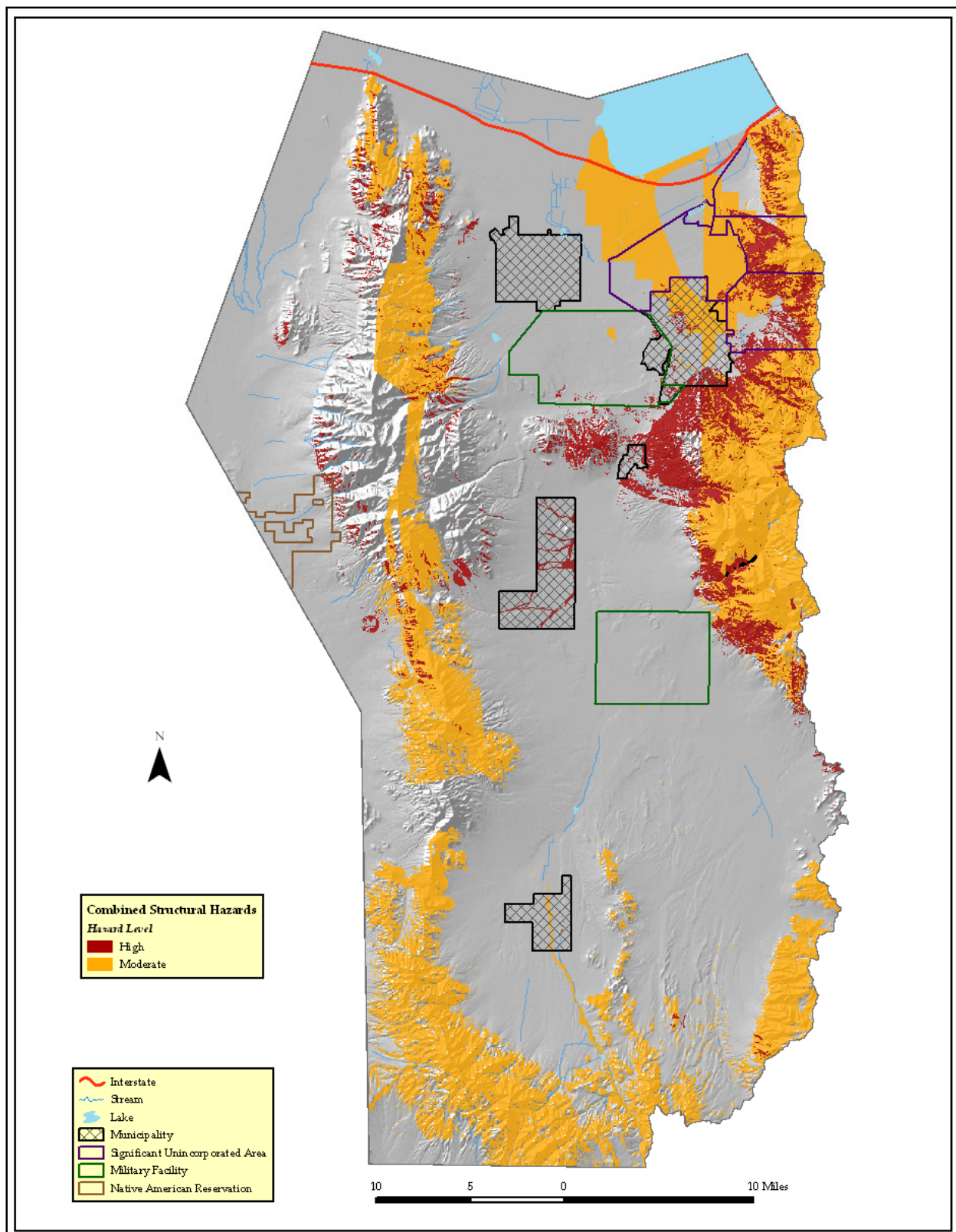
Those portions of the County that are near the Great Salt Lake are subject to high liquefaction in the event of an earthquake and therefore pose a risk to residents and structures. The County and municipalities can mitigate the earthquake threat and its secondary risks through the continued use of zoning ordinances and building codes. Examples of appropriate forms of land use along fault lines include “farms, golf courses, parks, and undeveloped open space” (UGS 1996).

Flooding is also of concern along canyon mouths, in alluvial fans and near the Great Salt Lake. Zoning restrictions on building location and building codes restricting basements would be well-suited in these areas.

Wildfire risk is most severe in the foothills. These areas, known as Wildland-Urban Interface (WUI) zones, are most vulnerable due to the amount and types of vegetation and structures that act as fuel to a burning fire. This threat may be mitigated by encouraging communities to become “Fire Wise Communities”, continued use of building and zoning codes and increase the public’s awareness.

Landslide/slope failure is another threat found near the foothills. Current development is not located near these areas. When future development does move into landslide-prone areas, more detailed landslide studies and zoning appropriate for high hazard areas will decrease the likelihood of landslides damaging persons and property.

Map 12-10 (page 272) shows the combined risk of nine structurally-threatening hazards (dam failure, earthquake, flood, landslide, lightning, problem soils, tornado, wildland fire and wind) in Tooele County. The areas of high hazard (red) are areas of high landslide and flood risk as well as the “extreme” risk wildland fire areas. These areas are best preserved as open space to protect citizens from almost certain disasters. The moderate areas of the map (orange) are those areas having moderate or greater risk from five (5) or more structurally-threatening hazards. These areas should be preserved as open space if not already developed or hazard-appropriate development encouraged. If already developed, these areas should be the initial focus of education campaigns and for regulatory requirements of hazard mitigation techniques by residents.



Map 12-10. Combined Structural Hazards, Eastern Tooele County

Mitigation Strategies

The following mitigation strategies were formulated by the Tooele County Mitigation Strategies Working Group on October 11, 2007, at the Tooele County Courthouse. The Working Group sought to refine and expand on efforts already in place. Information on Working Group members can be found in Part IV.

Dam Failure

Problem Identification: National statistics show that overtopping due to inadequate spillway design, debris blockage of spillways, or settlement of the dam crest account for 34% of all dam failures. Foundation defects, including settlement and slope instability, account for 30% of all failures. Piping and seepage cause 20% of national dam failures. This includes internal erosion caused by seepage, seepage and erosion along hydraulic structures, leakage through animal burrows, and cracks in the dam.

Goal # 1 – *Include dam failure inundation in future County planning efforts*

Objective #1 (Priority MEDIUM): Review current State Dam Safety information on all identified high hazard dams in Tooele County.

Action: Review dam failure inundation maps and Emergency Action Plans (EAPs) on high risk dams. If outdated work with irrigation companies and Utah Division of Water Rights, Dam Safety Section, to request updates to the EAPs and dam failure inundation maps, to be used for emergency and land use planning and incorporation in current County and City Emergency Operations Plans, as appropriate.

Time Frame: 1-2 years

Funding: Undetermined

Estimated Cost: \$5,000.00

Staff: Irrigation companies together with Tooele County Emergency Management, Tooele County Engineering, and the Utah Division of Water Rights

Drought

Problem Identification: Utah is the second driest state in the country. Tooele County has endured intermittent drought periods since 1999.

Goal #1 – *Identify all available ground water sources and quantify potential flows.*

Objective #1 (Priority: HIGH): Project how much growth the valley can sustain, where it can best sustain the growth and develop a groundwater management plan.

Action 1: Finalize the Tooele Valley Water Study and compile a groundwater management plan.

Time frame: Immediate

Funding: Tooele County, Tooele City, Stockton City, Stansbury Park, Kennecott Mining, Uintah Land, Grantsville City, Utah Division of Water Resources, Utah Division of Water Rights

Estimated cost: \$200,000

Staff: Tooele County Engineering, USGS and other county entities as listed above

Action 2: Offer incentives if a developer's plans include water conservation measures (xeriscaping) in the CCR's for the new communities (especially pertaining to common properties such as condominiums and town homes).

Time frame: 1-2 years

Funding: Unknown

Estimated cost: Unknown

Staff: Tooele County Engineering

Problem Identification: Tooele County has endured more than seven years of drought conditions. Actions must be taken to conserve water and address water shortages for both culinary and agricultural use.

Goal 2 – *Develop a drought management plan.*

Objective #2.1 (Priority HIGH): Take actions to maintain adequate culinary water supplies.

Action 1: Water reservoirs have insufficient storage capacity. Dredge reservoirs for increased capacity.

Time Frame: Immediate

Funding: Minimal

Estimated Cost: Undetermined

Staff: City/County Public Works, water treatment personnel, water districts

Action 2: Store water when there is surplus. Increase storage capacity through expansion.

Time Frame: Ongoing

Funding: Undetermined

Estimated Cost: Undetermined

Staff: City/County Public Works, water treatment personnel, water districts

Action 3: Manage surface and subsurface supplies as one. Implement redistribution and/or interconnections between reservoir drainage areas and surface/subsurface storage or wells.

Time Frame: 3 – 5 years

Funding: Undetermined

Estimated Cost: Undetermined

Staff: City/County Public Works, irrigation companies and water treatment personnel, water districts

Objective #2.2 (Priority HIGH): Limit unnecessary consumption of water throughout the County.

Action: Actively encourage water conservation through the development and distribution of outreach materials to each community.

Time Frame: Immediate/Ongoing

Funding: Undetermined

Estimated Cost: \$5,000

Staff: County Emergency Management, municipalities, water districts, USU Extension, Health Department
Jurisdictions: Countywide

Objective #2.3 (Priority MEDIUM): Address agricultural water shortages in the county.

Action: In areas of agricultural use, livestock water rotation should be set-up. Develop and distribute educational materials to ranchers and farmers in rural areas.
Time Frame: Ongoing
Funding: County, State and irrigation companies
Estimated Cost: \$5,000
Staff: County Emergency Management, USU Extension, water districts, irrigation companies
Jurisdictions: Countywide

Objective #2.4 (Priority MEDIUM): Encourage the development of secondary water systems.

Action: Coordinate with irrigation companies to develop a secondary water system and water distribution plan for drought.
Time Frame: 3 – 5 years
Funding: Undetermined
Estimated Cost: Undetermined
Staff: City/County Engineering and Public Works, Health Department, irrigation companies, water treatment personnel, water districts
Jurisdictions: Countywide

Earthquake

Problem Identification: Tooele County is a seismically active area with continuously recorded earthquake activity, with several active faults near population centers. Within the over 6,300 square mile area of Tooele County are six separate mountain ranges and the partial boundaries of several others. All of these north-south trending mountain blocks are bounded on at least one side by a zone of geologically recent faulting. Tooele Valley contains two major fault zones, the Oquirrh Marginal Fault on the east and the Six Mile Creek Fault between Marshall and Interstate 80. A sixteen-inch natural gas line crosses the fault in Middle Canyon and a portion of Tooele City's culinary water supply is located west of the fault in Middle Canyon. Rupture of the ground along the Oquirrh Marginal Fault may cause severe damage to these facilities and others which lie on or adjacent to the fault. In Rush Valley, seven potentially active fault zones have been identified from South Mountain on the north to the Sheeprock and Tintic ranges to the south. Tooele County is also adjacent to the Wasatch and Magna fault zones to the east, and may experience significant shaking and liquefaction from an event centered on one of these or other county fault zones.

Goal 1 – Protection of life and property before, during or after a major disaster and emergency response.

Objective #1.1 (Priority HIGH): Find sources of revenue to assist the county and its municipalities in maintaining the current communication and warning system capability.

Action: Find and apply for federal /state grants to maintain communication system currently in place.
Time Frame: Ongoing
Funding: Federal/state grants
Estimated Cost: \$1,000,000 annually
Staff: Tooele County Emergency Management
Jurisdictions: Countywide

Objective #1.2 (Priority HIGH): Provide Tooele County residents a secondary access/evacuation route

Action: Construct a “Midvalley Highway” to support SR-36 with an access/evacuation route.
Time Frame: 2-5 years
Funding: Federal/state grants, Utah Department of Transportation (UDOT), municipalities, developers
Estimated Cost: \$20,000,000
Staff: UDOT, County Engineering, County Emergency Management, contractors

Objective #1.3 (Priority HIGH): Establish/improve building and zoning codes to protect citizens from the effects of damaging earthquakes

Action: Create and/or improve natural hazard ordinances including codes for liquefaction. Make these easily accessible and downloadable on the County website and linked to the Emergency Management website.
Time Frame: Ongoing
Funding: County Engineering, County Emergency Management
Estimated Cost: Unknown
Staff: County Engineering, County Emergency Management

Problem Identification: Citizens and community leaders alike lack sufficient knowledge to make effective decisions to protect themselves from the earthquake hazard.

Goal 2 – *Countywide earthquake safety education and hazard information*

Objective#2.1 (Priority HIGH): Identify what damage could occur and where it could occur in an earthquake

Action: Collect and model data on a Richter Magnitude 5+ and 7+ earthquakes using HAZUS. Update current earthquake maps and incorporate into County GIS System.
Time Frame: Ongoing
Funding: State and local partnership
Estimated Cost: Unknown
Staff: State Division of Homeland Security, County Emergency Management, countywide jurisdictions, County GIS, UGS

Objective #2.2 (Priority HIGH): Improve public education regarding earthquake risks

Action: Provide information on earthquake effects to government officials, planners, homeowners, and developers.
Time Frame: Ongoing
Funding: County Engineering, County Emergency Management
Estimated Cost: Unknown
Staff: County Engineering, County Emergency Management

Flood

Problem Identification: Although Tooele County is located in a semi-arid region, it is subject to severe cloudbursts and spring snowmelt flooding and mudslides. Additional to the 1983-84 widespread floods in Northern Utah counties due to melted record setting mountain snow pack, Tooele County suffered flooding in 1996, 2005, and 2007 in Tooele City, Stansbury Park, Stockton, Grantsville and Hickman Canyon.

The Flood Insurance Rate Maps (FIRM) for Tooele County are fast becoming outdated with the influx of new development, and do not incorporate recent flood events.

Goal 1 – *Provide current FIRMS to planners, engineers and public works departments.*

Objective #1 (Priority HIGH): Use FIRM maps to establish floodplain baselines for construction.

Action 1: Maps are currently being updated and digitized for Tooele City, Bates, Middle and Settlement Canyons and Stansbury Park. The new FIRMS will not be effective until 2009.

Time Frame: 1-2 years
Funding: FEMA and the State of Utah
Estimated Cost: Unknown
Staff: Utah Division of Homeland Security (DHLS), FEMA, subcontractors

Action 2: Request flood maps and/or updates for Grantsville City, Hickman Canyon and the South Rim development in Stockton.

Time Frame: 2-3 years
Funding: FEMA, State, federal grants, increased building permit fees
Estimated Cost: Unknown
Staff: DHLS, FEMA, subcontractors

Action 3: Work in cooperation with local communities located within recognized flood plains to obtain a ranking <10 in the Community Ranking System (CRS) and make federally backed flood insurance policies available for properties at a discounted rate through the National Flood Insurance Program (NFIP).

Time Frame: 2 – 5 years
Funding: Federal/State grants, County Emergency Management, water districts, developers
Estimated Cost: Unknown

Staff: County Emergency Management, municipalities, water districts, FEMA, DHLS

Problem Identification: Streams and storm water drainage require regular maintenance in order to transport water effectively and prevent flooding. New development also causes changes through stream bed alteration and increased impervious surfaces.

Goal 2 – Develop a drainage master plan for all areas where there is a history of flooding and/or new development and rapid population growth.

Objective #2.1 (Priority HIGH): Improve drainage channels to avoid future flooding.

Action 1: Develop a drainage master plan; design and construct improved drainage channels, and detention ponds in appropriate areas of the County to include: Bates Canyon, Pine Canyon, Middle Canyon, Settlement Canyon, North and South Willow.

Time Frame: 2-5 years

Funding: Federal and State grants, municipalities, developers

Estimated Cost: \$300,000

Staff: DHLS, Utah Division of Water Resources, Tooele County, municipalities

Action 2: Develop a Surface Water Management Plan, design/construct storm water routes or channels to direct flows, and storm drain spot improvements according to the recently conducted Stansbury Park Storm Drainage Study.

Time Frame: Immediate

Funding: Federal /State grants, County and developers

Estimated cost: Unknown

Staff: Tooele County, Stansbury Park Improvement District

Action 3: Upgrade all culverts along SR36 to handle a 100-year storm event.

Time Frame: 1-2 years

Funding: Federal/state grants, County, developers

Estimated costs: Unknown

Staff: Public works

Action 4: Improve brush and debris removal from major drainages near county roadways and populated areas such as Middle, Settlement, South Willow and Ophir Canyons.

Time Frame: Ongoing

Funding: County municipalities, public works

Estimated cost: Minimal

Staff: County Roads Department, County Sheriff's detainee work crews.

Objective #2.2 (Priority HIGH): Look at Stansbury Park and Erda water table levels to determine where the water table has been and could come back to, to establish limits and develop guidelines for construction and the enactment of county ordinances regarding same.

Action 1: Enact construction ordinances for areas with historically high water tables to avoid the potential for future flooding.

Time frame: Immediate

Funding: Tooele County

Estimated Cost: Undetermined

Staff: Tooele County Engineering

Problem Identification: There is a lack of digitized data on flood events. This data needs to be incorporated into WebEOC®. As the world's first web-based emergency management communications system, WebEOC® provides cost-effective, real-time information sharing. By linking local, state, national, and even worldwide sources together, WebEOC® helps to facilitate decision-making in emergency situations or during major events.

Goal 3 – Tooele County should track flood events

Objective #3 (Priority MEDIUM): Record flood events

Action 1: Map (GPS) flood events, record flow levels, and incorporate data on flood events into WebEOC.

Time Frame: Ongoing

Funding: Federal/State grants, County Emergency Management, County Information Technology

Estimated Cost: Undetermined

Staff: County Emergency Management, County Information Technology

Problem Identification: Tooele County's population is rapidly growing and baseline data must be established to create and/or update construction ordinances based on FEMA flood elevations. Currently there are insufficient floodplain management ordinances.

Goal 4 – Enact floodplain development regulations.

Objective #3 (Priority HIGH): Establish ordinances with mandatory setbacks from 100-year and 500-year floodplains.

Action 1: Establish ordinance for mandatory setbacks.

Time Frame: 1-2 years

Funding: Local

Estimated Cost: Minimal

Staff: County Emergency Management, County/City Councils

Infestation

Problem Identification: Grasshoppers, Mormon crickets, and other types of insects negatively impact agriculture and landscaping within the County.

Goal 1 – Prevent/reduce insect infestation hazard

Objective #1 (Priority MEDIUM): Establish continuous funding sources for countywide insect control.

Action: Find grants and other funding sources to maintain insect control/containment
Time Frame: On going
Funding: Local
Estimated Cost: Minimal
Staff: U.S. Department of Agriculture (USDA) (APHIS), Utah Department Agriculture and Food (UDAF), USU Extension and local governments

Objective #2 (Priority MEDIUM): Utilize historical data to forecast infestation cycles and monitor pest populations to implement early prevention strategies.

Action 1: Provide historical data and other information to raise awareness levels of elected and appointed officials regarding infestation impacts and ripple effects.
Time Frame: On going
Funding: Municipal funds
Estimated Cost: Unknown
Staff: USDA APHIS, UDAF, USU Extension and local governments

Action 2: Review research data and develop additional insect monitoring sites
Time frame: On going
Funding: USDA APHIS, UDAF, and USU Extension
Estimated Cost: TBD
Staff: USDA APHIS, UDAF, and USU Extension

Severe Weather

Problem Identification: Severe weather-related incidents result in a large number of disaster declarations and emergency response needs.

Goal 1 – *Disseminate severe weather information to citizens in a timely manner*

Objective #1 (Priority MEDIUM): Educate more citizens about recognizing and knowing the dangers of severe weather hazards to encourage a more widespread and rapid response.

Action 1: Increase Weather Spotter training
Time Frame: Ongoing
Funding: Unknown
Estimated Cost: Minimal
Staff: County Emergency Management, National Weather Service

Action 2: Increase Amateur Radio Operator Involvement in weather observations
Time Frame: Ongoing
Funding: Unknown
Estimated Cost: Minimal
Staff: HAM Radio Club, County Emergency Management

Action 3: Install more electronic sign boards for alerting public of severe weather condition, especially along the Interstate 80 corridor.
Time Frame: Ongoing
Funding: UDOT
Estimated Cost: Unknown
Staff: Tooele County Emergency Management, Utah Department of Public Safety, UDOT

Wildland Fire

Problem Identification: Severe drought continues to maximize the potential for Urban-Wildland Interface (WUI) fires in areas of southeast Tooele, Little Mountain, South Mountain, Terra, Skull Valley, Dugway Proving Grounds, South Willow Canyon, western Grantsville, Lakepoint and east Erda.

Goal 1 – *Reduce the amount of fuels that can impact residential homes in the WUI areas*

Objective #1 (Priority HIGH): Study these areas to determine which fire resistant natural vegetation can be used.

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|------------------|---|
| <i>Action 1:</i> | Develop and distribute outreach documents specific to fire resistant vegetation
<i>Time Frame:</i> Ongoing
<i>Funding:</i> State/County
<i>Estimated Cost:</i> \$5,000.00
<i>Staff:</i> County Emergency Management, USFS, UDAF, County Extension Office |
| <i>Action 2:</i> | Take action through physical inspection to enforce codes currently in place
<i>Time Frame:</i> Ongoing
<i>Funding:</i> County
<i>Estimated Cost:</i> Undetermined
<i>Staff:</i> County Emergency Management, County/City Fire, County/City Police |
| <i>Action 3:</i> | Explain wildfire risk to people seeking building permits and realtors showing homes in risk prone areas, discourage building above 5577 feet above sea level (WUI areas), and provide a copy of the code and outreach documents.
<i>Time Frame:</i> Ongoing
<i>Funding:</i> Local
<i>Estimated Cost:</i> Undetermined
<i>Staff:</i> County/City Fire, County/City Engineering |
| <i>Action 4:</i> | Determine the specific areas where the Wildfire Protection Standards are in effect and make it available to the public in a graphic form.
<i>Time Frame:</i> 6 – 12 months
<i>Funding:</i> Local
<i>Estimated Cost:</i> Minimal
<i>Staff:</i> County GIS, County Emergency Management |

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